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ABSTRACT

This module is an introduction to traditional mathematics in Africa. A lesson plan is presented which explores the significance of words in the African number systems and compares them to American mathematical systems. Number words in four African languages are given as examples to illustrate base 5, 10, and 20 systems. Some words have been borrowed from Arabic when the particular base system does not include the desired numbers. Questions in the lesson plan challenge students to suggest social and economic opportunities which the early African number systems provided, possiblities of trade or relations with other groups in cases where their number words have the same derivation, and instances in both American and African mathematics where number words derive from physical terms, such as "foot." Among enrichment activities is a suggestion that students play "Count 'n Capture," a game of supposed African origin which involves mathematical and logical concepts. A bibliography lists eight sources for reading about mathematics and African history. (AV)

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THE NEW AMERICAN MATHEMATICS AND THE OLD AFRICAN MATHEMATICS

An Adventure in Comparative Mathematics

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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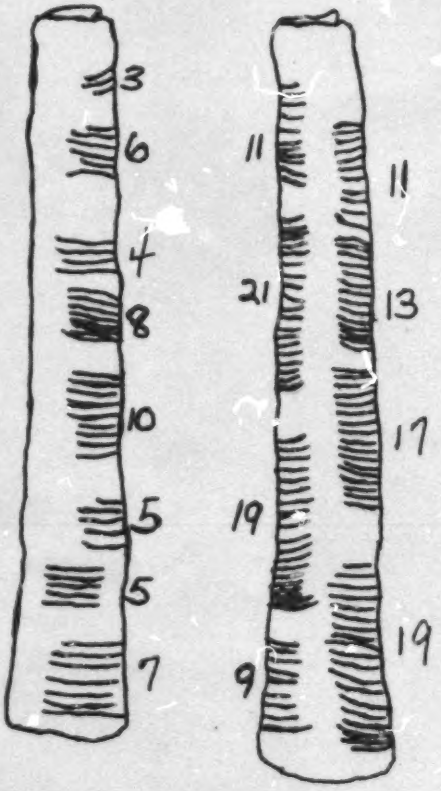

THE ISHANGO BONE

Discovered at Ishango, in Zaire on the shores of Lake Edward, the bone has an arrangement of notches which indicate that more than 8000 years ago, the hunting and fishing people of the area used a numeration system.

BLACK AFRICAN TRADITIONAL MATHEMATICS

	Mandingo	Mende
one	kilin	yera, ita
two	fila	fele
five	lulu	lolu
six	woro	woita
seven	wora wila	wofela

Hausa

one	daya	eight	takwas
two	biyu	nine	tara
three	uku	ten	goma
four	hudu	nineteen	goma sha tara
five	biyar	twenty	ashirin (Arabic)
six	shida (Arabic)	thirty	talatin (Arabic)
seven	bakwai	one hundred	dari

Swahili

one	moja	seven	saba (Arabic)
two	mbili	eight	nane (four and four)
three	tatu	nine	tisa (Arabic)
four	nne	ten	kumi
five	tano	twenty	ishirini
six	sita (Arabic)		

THE NEW AMERICAN MATHEMATICS AND THE OLD AFRICAN MATHEMATICS

- LESSON PLAN -

How do African number systems provide insights into African cultures and civilizations?

For every discipline there is a vocabulary essential for understanding it. For mathematics some of the key terms are:

- to count : to express in mathematical terms objects, abstract items, concepts, things in our environment;
- to tally : to record visibly; to mark off on something;
- prime number : a number divisible only by itself and one, i.e., 3, 5, 7, etc.;
- set : a group of similar things, such as a flock or a herd.

Sets are important concepts both in African and Western societies. A computer, for example, uses a binary set made up of 2 digits, 0 and 1. To count with a binary set one systematically combines the two digits in the same manner that we combine the 10 digits (0-9) of our denary set, i.e., 0 = 0; 1 = 1; 10 = 2; 11 = 3; 100 = 4; and so on.

Any number of sets are possible; some of the most common are the tertiary set (base 3) with 0, 1 and 2 as digits, a quinary set (base 5) with 0, 1, 2, 3, 4; a duodenary (base 12) with 0-12; a vigesimal (base 20) with 0-19.

1. Most traditional African mathematical systems are based on 5, 10, and 20; some are binary and tertiary sets.

a) Examine the Swahili number-words attached; how do these support the belief that Swahili speakers used a base five?

a) - borrowed words for 6 and other.
- Note! Hausa has done the same.

b) What does the use of Arabic numbers suggest about the people who speak Hausa and Swahili?

b) - they had a trading relationship with Arabs and incorporated the Arab method of counting into their own.

c) Compare and contrast the Mende and Mandingo numbers. Some numbers are very similar, i.e., 2 is "fila" and "fele". What does this suggest about these two peoples?

c) - they live near one another;
- they may be related;
- they may have traded with each other.

The Mende and Mandingo words for 6 mean "add 1 to 5" and for 7, "add 2 to 5", supporting the belief that they, too, used base 5.

2. Among many West Africans, the primary base of the number system is 5. Sometimes, this is the same word as the word for hand; 10 often is the word for 2 hands, while 20 is the same for person.

a) Do we use similar measurements?

a) - a "hand" is a unit of measure equal to about 4 inches, used especially to measure horses;
- a "foot" = 12 inches;
- others?

Note that a foot (12 inches) is the unit of our secondary base. Some Africans use 20 as a secondary base.

3. The ancient tool reproduced on the attached sheet suggests that Africans more than 8,000 years ago used and understood mathematical concepts similar to those we use today.

a) Examine the picture. What concepts does it suggest they used?

a) - prime numbers (11, 17, etc.)
- fractions and ratio (3 - 6; 4 - 8);
- addition; subtraction;
- multiplication by 2.

4 What do African number systems tell us about African cultures and civilizations?

- system of mathematics provided parameters for a calendar;
- economic transactions were possible and markets operated;
- continued contacts between and among ethnic groups persisted;
- ability to observe and reproduce patterns in textiles;

.../3

4. (continued...)

- census of persons possible (in spite of the taboo);
- construction of pyramids, temples and bridges.

Enrichment

- Why is the United States changing over to the metric system?
- What advantages does this system have over ours?

- more universal, accurate and effective;
- it is simpler to use being completely based on 10.

Have students play a "Count 'n Capture" game*. It is thought this game originated in Africa. As they play have them consider what mathematical and logical concepts are applied during the game.

- *known as Warri, Owori, Umweso, etc. A set can be purchased from The Cooperative Recreation Service in Delaware, Ohio 43015, or one can be made from egg cartons or muffin tins with beans or buttons. See the Zaslavsky article in The Arithmetic Teacher for rules.

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